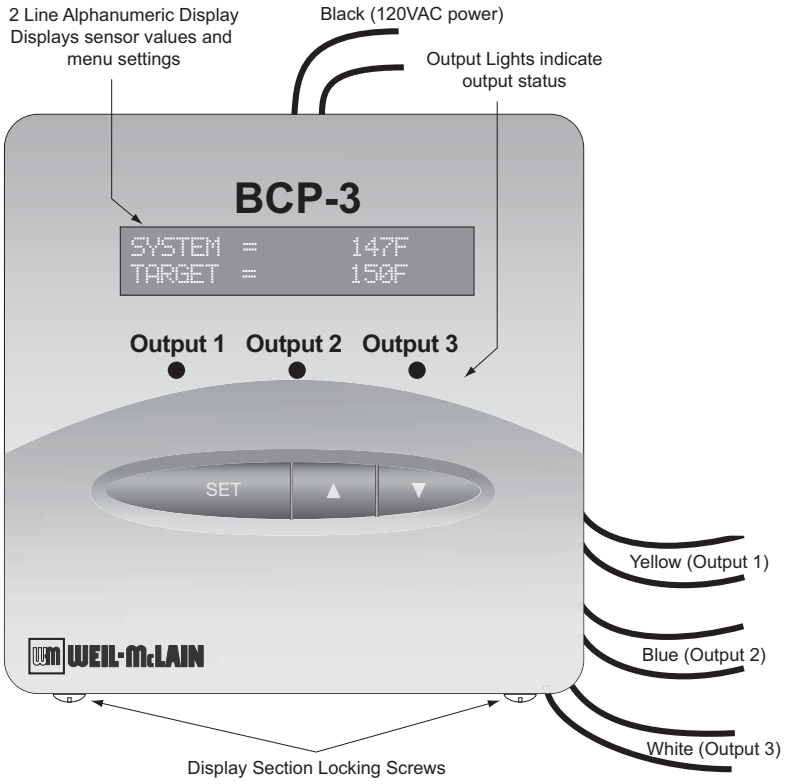
WEIL-McLAIN BCP-3

Hydronic Multi-Stage Boiler Control

INSTALLATION AND OPERATION INSTRUCTIONS

Hot Water Control with Outdoor Reset, Set Point, and DHW for Hydronic Applications



The BCP-3 is a multi-boiler or multi-stage outdoor reset hydronic heating control. It establishes ambient comfort by varying the temperature of the heating system's circulating hot water in response to changes in the outdoor temperature. In addition, it provides an outdoor temperature based cutoff, heating system pump control, and domestic hot water (DHW) pump control. Two unique features have been added to this control including a customized reset ratio curve. A Set Point option was added for applications where outdoor reset will not apply.

Two sensors are used, one to monitor the outdoor temperature and one to monitor the circulating hot water temperature in the heating system. When the outdoor temperature falls below the outdoor cutoff setting, the heating system is activated and the target water temperature is increased proportionally to satisfy the load. Should it get warmer outdoors, the target water temperature is automatically lowered by the control. If the outdoor temperature continues to rise to the outdoor cutoff setting then the heating system is turned off.

Because of the many different physical characteristics of buildings including the type of radiation; i.e., baseboard or radiant, the heat loss varies. In one building, a 1-degree outdoors temperature change may require a change of 1 degree in heating water temperature; for another it may require a change of 2, 3, or even 4 degrees in order to gain the desired comfort level. This is known as the Reset Ratio. The Reset Ratio chart shows the wide range of Reset Ratios available for the BCP-3 in addition to the customized reset ratio. See page 2.

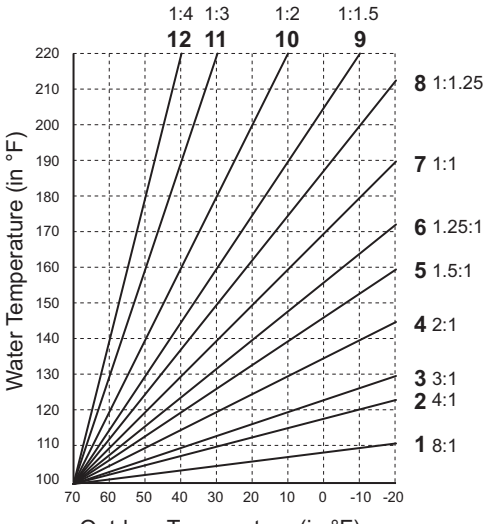
The installer fits the BCP-3 to a specific building by adjusting the Reset Ratio curve. With curve number 4 (2:1 reset ratio) a 2-degree change in outdoor temperature will change the circulating hot water temperature by 1 degree; at curve number 11(1:3 reset ratio) an outdoor change of 1 degree will change the water temperature by 3 degrees. Most buildings with baseboard radiation require a curve of 6, 7, or 8. Radiant heat applications usually require a lower curve. An external T-Stat input can be used to shut the heating system down when the

⚠ WARNING **This Weil McLain control is strictly an operating control; it should never be used as a primary limit or safety control. All equipment must have its own certified limit and safety controls required by local codes. The installer must verify proper operation and correct any safety problems prior to the installation of this Weil McLain control.**

thermostat is satisfied. Another, is a Setback input that will switch the heating system to a lower set point determined by the Set Back setting.

Type of Radiation in Building	Reset Ratio	Offset
Radiators (Steel & Cast Iron)	1.00 (O) : 1.00 (S)	0˚F
Baseboard (Finned copper tube& Cast Iron)	1.00 (O) : 1.00 (S)	0˚F
Radiant (High Mass/Concrete)	4.00 (O) : 1.00 (S)	-10˚F
Radiant (Low Mass/Joists)	2.00 (O) : 1.00 (S)	-10˚F
Fan Coils & Air Handlers	1.00 (O) : 1.00 (S)	20˚F

An optional domestic hot water input is provided for systems where an indirect tank provides DHW. During a DHW call, the BCP-3 will maintain a constant set point of 200°F or the Maximum Water Temperature setting, whichever is lower, regardless of outdoor temperature or the status of the heating system. If 1-On/Off+2-Pumps Output Mode option was selected, the DHW pump will be enabled whenever there is a call for DHW. In addition, the heating system pump can be programmed to turn off during a DHW call for up to 120 minutes to satisfy the DHW demand quicker while withholding building heat.



Reset Ratio Curves

Reset Ratios are presented as Outdoor : Water

Operation Concept

The BCP-3 has multiple Output Modes of operation. It can control any three output boiler-and-pump variety ranging from a single On/Off boiler with a system pump to three individual boilers. In addition, it can accepts a DHW call signal to raise the target set point. Moreover, if "1-On/Off+2-Pump" is selected as an Output Mode, it will control the DHW pump allowing it to energize on a DHW call. (See Output Mode Table under the Startup Menu on page 4.)

Boiler Operation

- When a single On/Off boiler is selected as the primary function of the BCP-3, the boiler relay will energize when the System Sensor reading is below the Target temperature less the Differential. Moreover, the Outdoor Sensor reading must be below the Outdoor Cutoff setting and the EXT+/EXT- (Enable/Disable) terminals must be shorted using a dry-contact switch or a jumper. If the System temperature exceeds the Target, the boiler relay will de-energize.
- If sequencing multiple stages or boilers are the primary function of the BCP-3, the BCP-3 will use the Purge Delay to start the lead boiler. Then, it will use the Reaction Time to add additional stages or boilers. When subtracting stages, the BCP-3 will use only the Minimum Run Time.

System Pump Operation

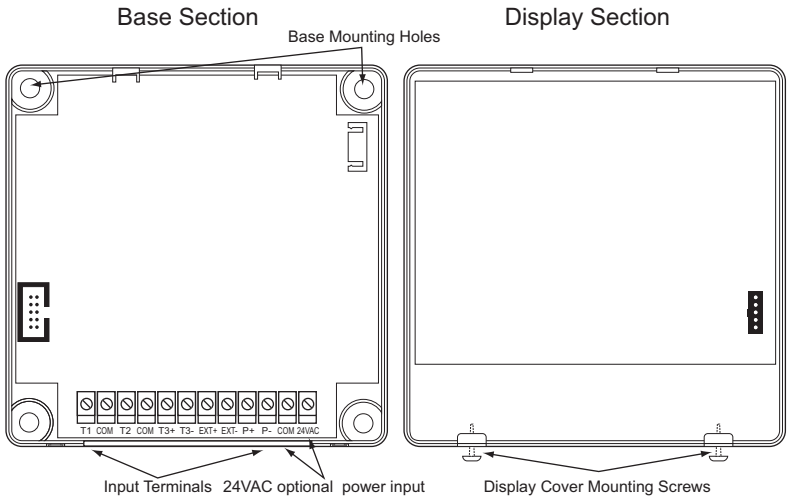
- When the BCP-3 is in one of the Output Modes that control the System Pump relay while the EXT+/EXT- (Enable/Disable) terminals are shorted using a dry-contact switch or a jumper, the System Pump relay will energize, as long as the Outdoor Sensor reading is below the Outdoor Cutoff setting. However, upon the opening of the EXT+/EXT- (Enable/Disable) terminals or if the Outdoor Sensor reading rises two degrees above the Outdoor Cutoff setting, all boiler relays will de-energize and the System Pump relay will remain energized for the Run-On delay period before de-energizing.
- If DHW Priority was set to other than "NO", a DHW call using terminals T3+/T3- (DHW call Input) will de-energize the System Pump relay for the period of the DHW priority or the termination of the DHW call, whichever comes first. This will ensure all boiler outputs are directed to produce domestic hot water.
- If DHW Priority was set to "NO", then a DHW call will not have any effect on the System Pump relay.

DHW Pump Operation

- When the BCP-3 is controlling the DHW Pump relay by selecting "1-On/Off+2-Pump" mode from the Output Modes, a DHW call using terminals T3+/T3- (DHW call Input) will energize the DHW Pump relay. In addition, the BCP-3 will raise the Target temperature to the lower of 200˚F or the Maximum Water temperature Setting.
- When the BCP-3 is in Outdoor Cutoff or when the EXT+/EXT- (Enable/Disable) terminals are open, a DHW call will energize only the DHW Pump relay in a DHW Priority setting. See Output Mode Table on page 4. However, if No DHW Priority was selected, both the System and DHW Pumps will energize on a DHW call.

Mounting the Controller

- The BCP-3 is designed to mount on a 1900 (4”x4”) deep electrical box.
- If additional room is needed for wiring use the extension skirt provided.
- Place the BCP-3 in an indoor convenient location near the unit to be controlled and away from excessive heat or cold.
- Partially unscrew the Display Cover Mounting screws. This allows for its removal.
- Lifting the Display Section away from the base starting with the bottom will unplug it from the Base section.
- Proceed with the power and output wiring instructions.
- Use the screws provided to mount the BCP-3 to the 1900 box or the extension skirt.
- Mount Display Section back to the Base Section. Tighten the Display Cover Mounting Screws.


Base Section
Display Section
Base Mounting Holes
T1 COM T2 COM T3+ T3- EXT+ EXT- P+ P- COM 24VAC
Input Terminals
24VAC optional power input
Display Cover Mounting Screws

⚠ WARNING

The BCP-3 can accept only one source of power: 120VAC or 24VAC. If more than one power source is applied, the unit may be damaged.

Wiring

Wiring Power Input

The BCP-3 is designed to accept ***ONLY A SINGLE POWER SOURCE***. It can be wired to either 120VAC using the two Black wires or 24VAC using the right most two terminals on the terminal block on bottom of the control. Weil McLain recommends the installation of a Surge Suppressor and a Power Switch before the Power Line connection for safety and ease of service.

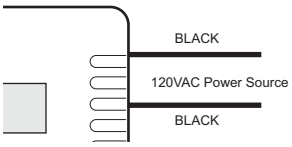
120VAC

- Attach line voltage, 120VAC, to the two Black wires extending from the back of the BCP-3. Remember to use the power line from a different source than the equipment being controlled.

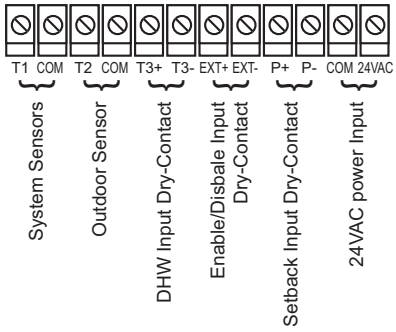
24VAC

- Use a dedicated transformer with at least a 5VA output.
- Bring 24VAC to the two right most terminals on the front of the BCP-3 marked *24VAC and COM.*

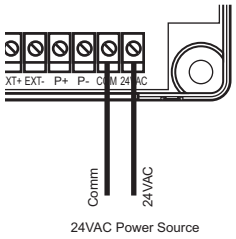
120VAC Power Wiring



Input Terminals


T1 COM T2 COM T3+ T3- EXT+ EXT- P+ P- COM 24VAC
System Sensors
Outdoor Sensor
DHW Input Dry-Contact
Enable/Disbale Input Dry-Contact
Setback Input Dry-Contact
24VAC power Input

24VAC Power Wiring



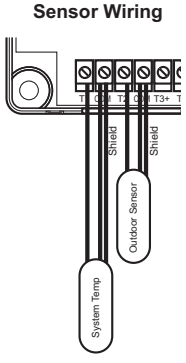
Wiring Input Terminals

Heating System Sensor (HSS) Installation (T1, COM)

Locating HSS

- Place the Heating System sensor in the common header where it will register the output of the boilers before any takeoffs.
- Only use the Standard Brass Tube sensor provided.
- The sensor wires can be extended up to 500' using a shielded 2-conductor cable (Belden #8760 or equivalent (#18/2)).
- Cut the shield and do not connect it at the sensor end. Only connect it at the control end using the outdoor terminal marked COM. Do not ground the shield at the sensor but at the control using the COM terminal.
- Do not run sensor wires in conduit with line voltage wiring.

Sensor Wiring



Immersion Heating System Sensor (HSS) Installation

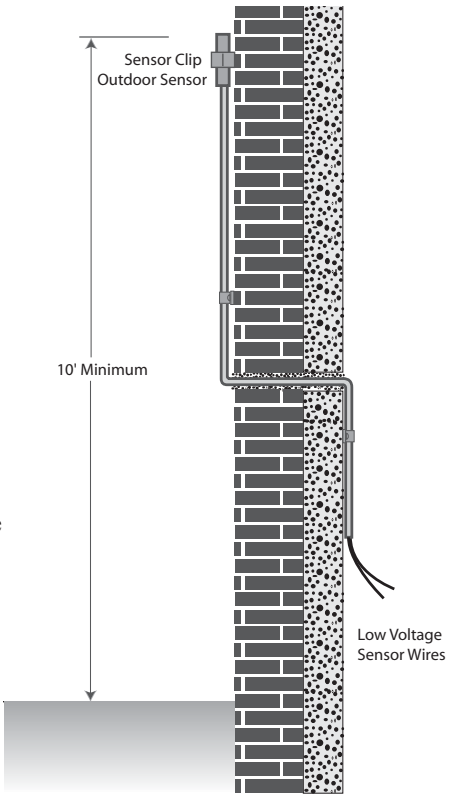
- Install a 3/8"ID x 1/2"NPT immersion well.
- Insert the supplied sensor probe into the well.

Strap-On Heating System Sensor (HSS) Installation

- Strap the sensor to the pipe using a metal clamps. Do not over tighten the clamp.
- Strap pipe insulation around the sensor and the pipe.

⚠ IMPORTANT

Determining the proper location for the Outdoor Sensor is very important. The BCP-3 will base the heat on the outdoor temperature information it receives from this location. If the sensor is in the sun, or covered with ice, its reading will be different from the actual outdoor temperature.



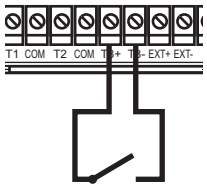
Outdoor Sensor Installation (T2, COM)

- The Outdoor Sensor must be used when Outdoor Reset is selected as the Control Mode from the Startup menu. However, in Set Point mode, the Outdoor Sensor is optional. When connected in that mode, it will be used as an input for the Outdoor Cutoff only.
- Only use the Weil McLain sensor included with the unit.
- Place the sensor in the shade on the north side of the building.
- Be sure the location is away from doors, windows, exhaust fans, vents, or other heat sources.
- The sensor should be mounted approximately 10' feet above ground level.
- Mount the sensor clip base to the outside of the building. Insert the sensor in the middle and snap close the second clip on the sensor.
- The sensor wires can be extended up to 500' using shielded 2-conductor cable.
- Cut the shield and do not connect it at the sensor end. Only connect it at the control end using the outdoor terminal marked COM.
- Do not run sensor wires in conduit with line voltage wiring.

Wiring the Domestic Hot Water Call DHW (T3+, T3-)

- A DHW call will raise system Set Point to 200°F or Maximum Target temperature, whichever is lower.
- When "1-On/Off+2-Pump" is selected as the Output Mode from the Startup menu, the BCP-3 can control the operation of the Domestic Hot Water (DHW) pump using Output 3. See Output Mode Table on page 4.
- DHW Call terminals are dry contact N.O. terminals.
- Wire an aquastat or another control to provide dry contact closure on the DHW Call terminals.

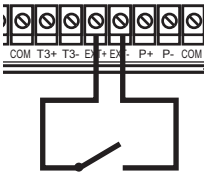
DHW Call Wiring



Wiring the Enable/Disable (TSTAT) (EXT+, EXT-)

- The EXT terminals can be used to enable or disable the heat to the system by connecting it to a thermostat, external control, or a switch. It accepts dry contact input only.
- If no thermostat or control is connected to the EXT terminals, leave the jumper supplied connected.
- No outputs will be active unless the EXT terminals are closed/shorted.

Enable/Disable Wiring



Wiring the Setback/Boost (P+, P-)

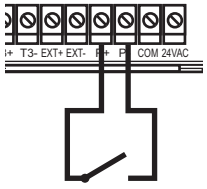
- The Setback feature can be used to provide the BCP-3 with a lower temperature Set Point when less heat is required during night or unoccupied periods.
- The Setback is activated by closing/shorting the P+ and P- terminals using an external control, i.e. timer or switch.

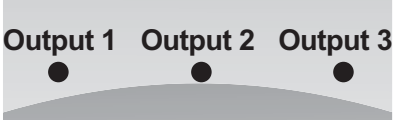
Wiring Outputs

Wire Colors and Output Lights

- The BCP-3 has a three S.P.S.T. (N.O.) output relays. Each relay is rated at 1A Inductive load (1/8 HP).
- The BCP-3 has three LED lights that follow the output relays' operation. When a relay energizes, its LED will turn on. When the relay de-energizes, its LED will turn off.
- The outputs are dry contacts only. They do not source any power.
- The two Yellow wires represent Output 1 relay and the left LED.
- The two Blue wires represent Output 2 relay and the middle LED.
- The two White wires represent Output 3 relay and the right LED.
- Depending on the Output Mode of operation selected during the Startup, the function of each output will vary. See Output Mode Table for output wire colors and functions on page 4.

Setback/Boost Wiring

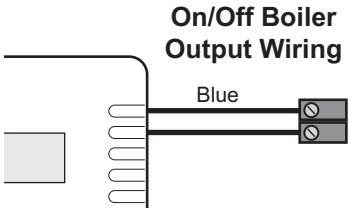




Output Mode Table

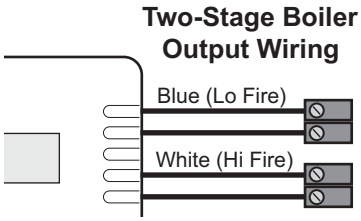
Output Mode	Description	Output 1 (Yellow Wires)	Output 2 (Blue Wires)	Output 3 (White Wires)	Notes
1-On/Off+1-Pump	One On/Off boiler and a System pump	Sys Pump	Boiler	Not used	
1-On/Off+2-Pump	One On/Off boiler, a System pump and a Domestic Hot Water Pump	Sys Pump	Boiler	DHW Pump	
2-On/Off+1-Pump	Two On/Off boilers and a System pump	Sys Pump	Boiler 1	Boiler 2	DHW Pump controlled by DHW Aquastat
1-Lo/Hi+1-Pump	One Lo/Hi boiler and a System pump	Sys Pump	Boiler Lo	Boiler Hi	DHW Pump controlled by DHW Aquastat
3-On/Off	Three On/Off boilers and NO pumps	Boiler 1	Boiler 2	Boiler 3	Sys Pump controlled using other controls or run constantly.

Wiring the Boiler Output



Single-Stage (On/Off) Boiler Wiring

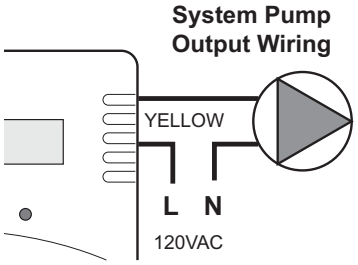
- If any of the "1-On/Off" Output Modes is selected, wire the two Blue wires to the boiler circuit.
- If more than one On/Off boiler is to be controlled by the BCP-3, follow the wiring colors as per the Output Mode Table above.
- The BCP-3 does not source any output power to the boiler. The relay makes when energized.



Two-Stage (Lo/Hi) Boiler wiring

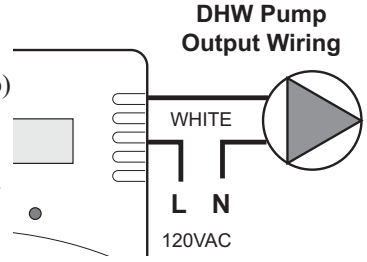
- Wire the two Blue wires to the boiler control circuit initiating the Low Fire signal.
- Then, wire the two White wires to the High fire circuit.
- The BCP-3 does not source any output power to the boiler. The relay makes when energized.

Wiring the System and DHW Pump Outputs



System Pump Wiring (Not Available With "3-On/Off" Output Mode)

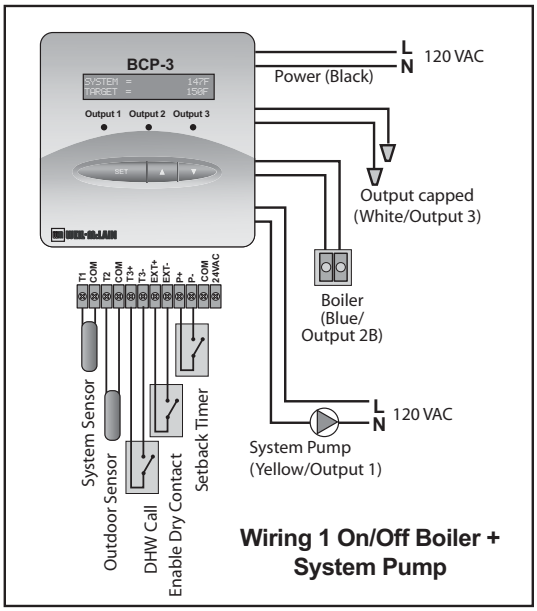
- The BCP-3 will control the System Pump relay (Maximum of 1/8 HP) in all Output Modes except (3-On/Off), as all outputs will be used by boiler stages. In this scenario, the system pump can be controlled independently using a switch or left to run constantly.
- Wire the two Yellow wires to the System Pump circuit.
- The BCP-3 does not source any output power to the pump. The relay makes when energized to switch the power to the pump on.



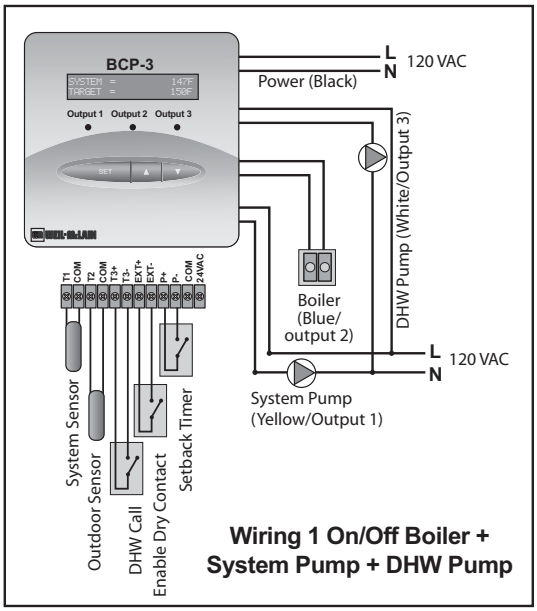
DHW Pump Wiring (Available Only With "1-On/Off+2-Pumps" Output Mode)

- The BCP-3 will control the DHW Pump relay (Maximum of 1/8 HP) only in (1-On/Off+2-Pump) Output Mode. In the other modes, the DHW pump can be controlled using an external DHW aquastat.
- If the BCP-3 is controlling the DHW pump, wire the two White wires to the DHW Pump circuit.
- The BCP-3 does not source any output power to the pump. The relay makes when energized to switch the power to the pump on.

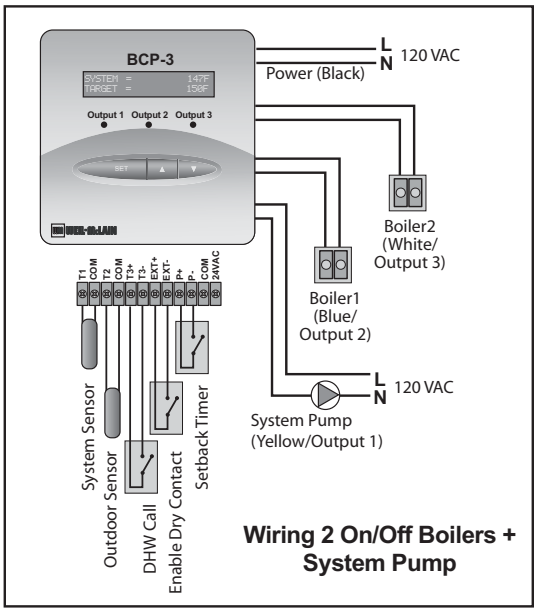
BCP-3 Output Modes Wiring



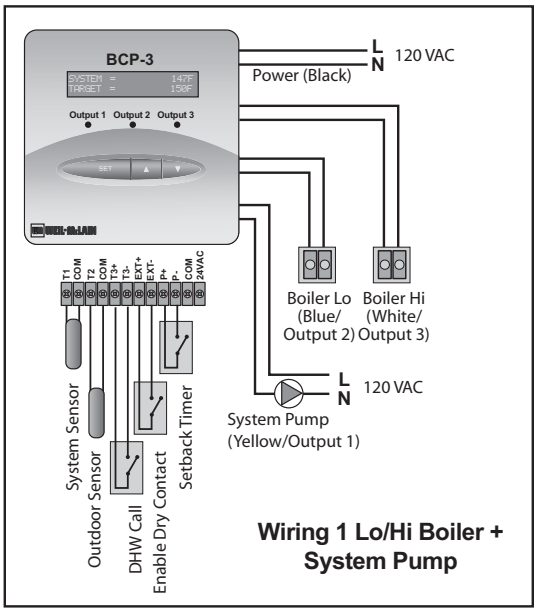
Wiring 1 On/Off Boiler + System Pump



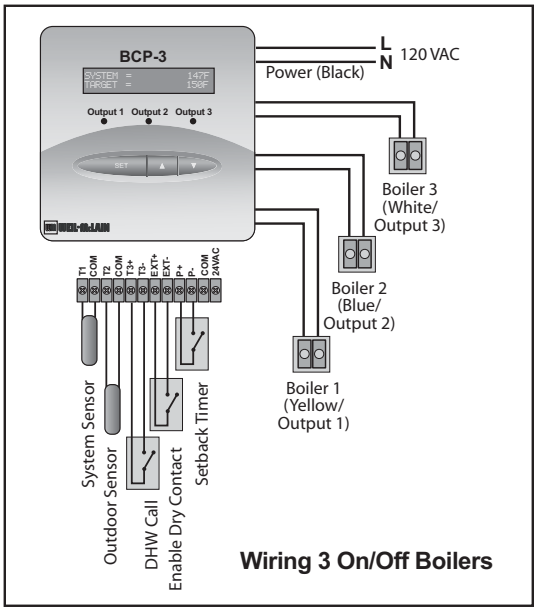
Wiring 1 On/Off Boiler + System Pump + DHW Pump



Wiring 2 On/Off Boilers + System Pump



Wiring 1 Lo/Hi Boiler + System Pump

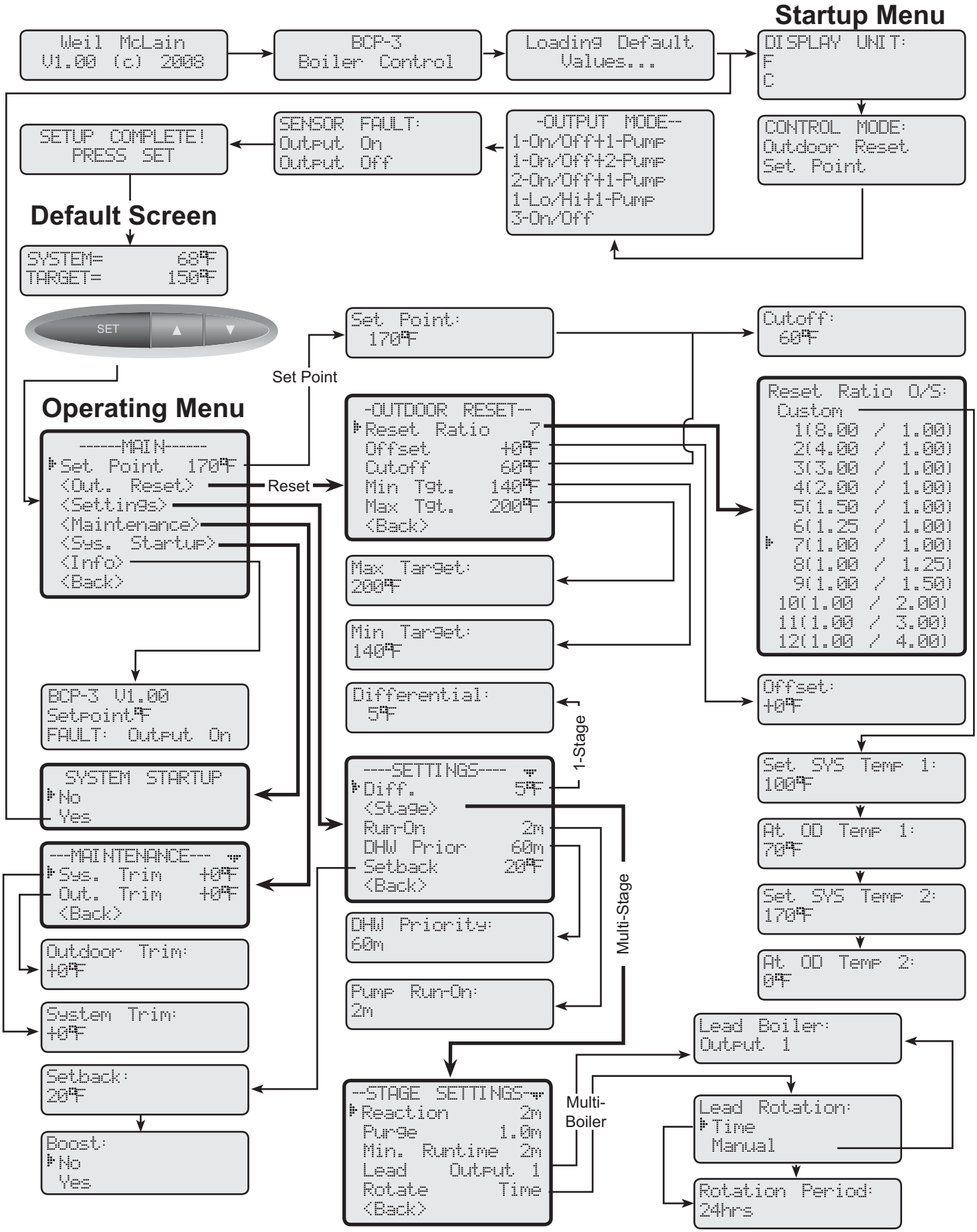


Wiring 3 On/Off Boilers

NOTES:

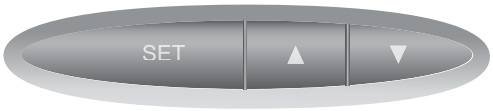
- The BCP-3 does not source any output power to any of its relays. A power source must supply the pumps with power and the control can break the hot leg.
- Weil McLain recommends not sharing the power source to the control with any pumps, boilers, or heavy electric equipment.
- When wiring a sensor to the BCP-3, connect the Shield to the COM terminal on the BCP-3 end. DO NOT connect the Shield at the sensor end.
- Eventhough in some Output Modes the BCP-3 does not control the DHW Pump, a DHW call will raise the System Target to whichever is lower of 200F or the Maximum Water Temp.

Menus


Startup Menu
Weil McLain
V1.00 (c) 2008
BCP-3
Boiler Control
Loading Default
Values...
DISPLAY UNIT:
F
C
CONTROL MODE:
Outdoor Reset
Set Point
-OUTPUT MODE--
1-On/Off+1-Pump
1-On/Off+2-Pump
2-On/Off+1-Pump
1-Lo/Hi+1-Pump
3-On/Off
SENSOR FAULT:
Output On
Output Off
SETUP COMPLETE!
PRESS SET
Default Screen
SYSTEM= 68°F
TARGET= 150°F
SET
Operating Menu
-----MAIN-----
Set Point 170°F
<Out. Reset>
<Settings>
<Maintenance>
<Sys. Startup>
<Info>
<Back>
Set Point
Reset
Set Point:
170°F
-OUTDOOR RESET--
Reset Ratio 7
Offset +0°F
Cutoff 60°F
Min Tgt. 140°F
Max Tgt. 200°F
<Back>
Cutoff:
60°F
Reset Ratio O/S:
Custom
1(8.00 / 1.00)
2(4.00 / 1.00)
3(3.00 / 1.00)
4(2.00 / 1.00)
5(1.50 / 1.00)
6(1.25 / 1.00)
7(1.00 / 1.00)
8(1.00 / 1.25)
9(1.00 / 1.50)
10(1.00 / 2.00)
11(1.00 / 3.00)
12(1.00 / 4.00)
Max Target:
200°F
Min Target:
140°F
Differential:
5°F
Offset:
+0°F
BCP-3 V1.00
Setpoint°F
FAULT: Output On
SYSTEM STARTUP
No
Yes
---SETTINGS---
Diff. 5°F
<Stage>
Run-On 2m
DHW Prior 60m
Setback 20°F
<Back>
1-Stage
Multi-Stage
Set SYS Temp 1:
100°F
At OD Temp 1:
70°F
Set SYS Temp 2:
170°F
At OD Temp 2:
0°F
--MAINTENANCE--
Sys. Trim +0°F
Out. Trim +0°F
<Back>
DHW Priority:
60m
Pump Run-On:
2m
Outdoor Trim:
+0°F
System Trim:
+0°F
Setback:
20°F
Boost:
No
Yes
--STAGE SETTINGS--
Reaction 2m
Purge 1.0m
Min. Runtime 2m
Lead Output 1
Rotate Time
<Back>
Multi-Boiler
Lead Boiler:
Output 1
Lead Rotation:
Time
Manual
Rotation Period:
24hrs

Button and Navigating Menus

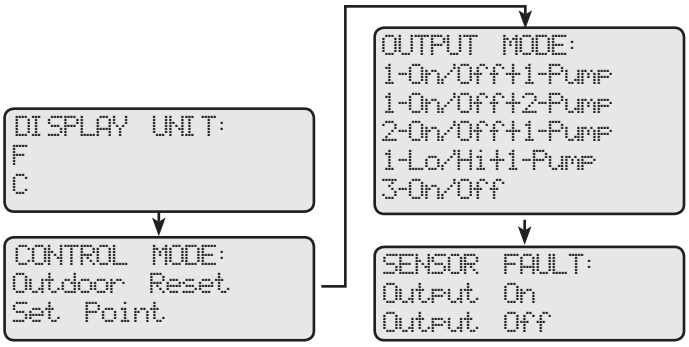
The BCP-3 has three buttons.



- The SET button function varies. When the Default Screen is displayed, pressing the SET Button views the MENU. When in the Menus and settings, the SET Button accepts the selected entry or setting value.
- When in the menus, pressing the Up and Down buttons will scroll through the menu options. They can be used to change the setting of a specific function. I.e., change the Set Point, Differential, or System Trim. In addition, when in the default screen, the Up and Down buttons will display the outdoor temperature and Outdoor Cutoff.
- At the end of every operation menu there is a <Back> option that allows the user to go back one menu level. If the SET Button was held down for three seconds on the <Back> option, the display will go back to the default screen.

Startup Options

When the control is initiated for the first time or after a manual reset, it will start its operation with the Startup Menu. Later, the Startup menu can be accessed as an option from the operation menu. An option must be accepted in each screen in the Startup Menu to move to the next level.

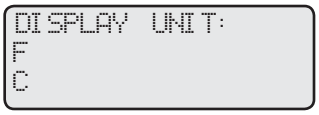


Display Unit

Options: **°*F*, °C** **Default: °F**

SET */<System Startup>/Display Unit*

- The BCP-3 will offer two different temperature display standards. If ºF is selected, all temperatures will display in Fahrenheit. If ºC is selected, all temperatures will display in Celsius.

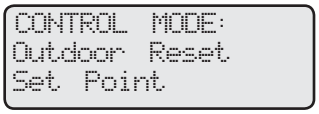


Control Mode

Options: **Outdoor Reset, Set Point** **Default: Outdoor Reset**

SET */<System Startup>/Display Unit/Control Mode*

- The new BCP-3 has two heating logics. Outdoor Reset; varies the system set point/target based on outdoor temperature. This selection adds several menu options to adjust and fine tune the reset curves: Reset Ratio, Offset, Min Water temp, Max Water temp, and Outdoor Cutoff. In addition, a customized reset ratio curve will be available for specialized applications.
- Set Point; gives the installer the flexibility of selecting a fixed set point. The Outdoor Cutoff will be available if an outdoor sensor was installed.



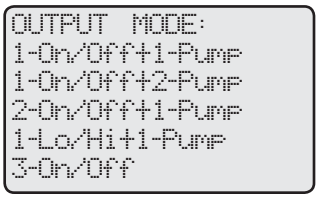
Output Mode

Options: **1-On/Off+1-Pump, 1-On/Off+2-Pump, 2-On/Off+1-Pump, 3-On/Off**

Default: 2-On/Off+1-Pump

SET */<System Startup>/Display Unit/Control Mode/Output Mode*

- The new BCP-3 has multiple operating Output Modes of heating. Each can be applied based on the number of boilers, stages, and pumps controlled. See Output Mode Table on page 4.



Sensor Fault

Options: **Output On, Output Off** **Default: Output On**

SET */<System Startup>/..../Sensor Fault*

- The Sensor Fault will determine the operating status of the output relays when a sensor reads Short or Open. On sensor fault, the Set Point will indicate FAULT TGT=ON or OFF to indicate the condition of the output and the faulty sensor will read OPEN or SHORT to indicate the condition of the sensor.

Outdoor Reset Mode

- When Output-On is selected, the BCP-3 will energize all boiler and system relays when the System reads SHORT or OPEN and Outdoor is below Outdoor Cutoff. Thus, all boilers will run on their limits. However, if the Outdoor sensor fails and the Outdoor reads SHORT or OPEN, the BCP-3 will change the Target Set Point to the Max Water Temperature.
- When Output-Off is selected, the BCP-3 will turn all boilers Off when the System sensor reads SHORT or OPEN. However, when the Outdoor sensor reads SHORT or OPEN, the BCP-3 will change the Target Set Point to be the Min Water Temperature.

Set Point Mode

- When Output On is selected, the BCP-3 will turn all boilers On when the System sensor reads SHORT or OPEN.
- When Output-Off is selected, the BCP-3 will turn all boilers Off when the System sensor reads SHORT or OPEN.
- The Outdoor Sensor fault status will not affect the control operation in Set Point mode. And, no Outdoor Cutoff will be available.

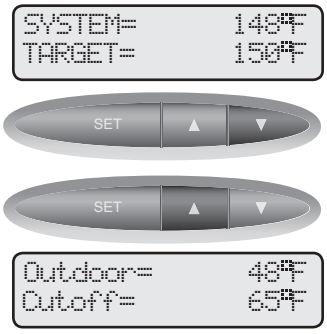
Setting the Control to Factory Default

To Reset the BCP-3 control to its original factory defaults, power down the control. Hold down the SET and DOWN buttons while powering the control back up until the Loading Default Values screen appears. The Display will direct you to the Startup menu after the defaults are loaded to program the control.

NOTE: When resetting the control to original factory defaults all control settings will be over written and will no longer exist.

Default Display

The default display will show the current System temperature and the Target temperature. By clicking the Up or Down button, the display will show the current Outdoor temperature and the Outdoor Cutoff.

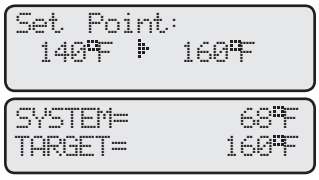


Operating Menu Options (Click SET Button)

Set Point (Available when Startup Control Mode = Set Point)

Options: **From -30°F/-34°C to 250°F/121°C** **Default: 140°F/60°C**

SET */Set Point*

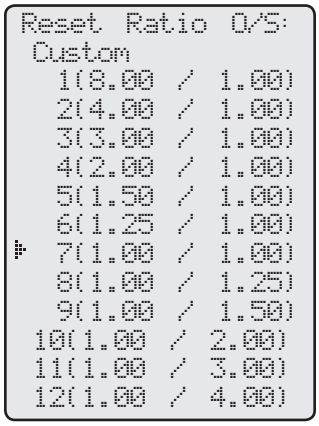


- The Set Point option provides the user with an adjustable fixed Target temperature to control the system. If an Outdoor Sensor was connected, the next menu option will show Outdoor Cutoff. Otherwise, there will be no Outdoor Cutoff option.
- The Set Point less the Differential should be set above the boiler manufacturer minimum water temperature requirements to protect the boilers.

Outdoor Reset (Available when Startup Control Mode = Outdoor Reset)

Options: **From 1(8.00°/1.00°) to 12(1.00°/4.00°), and Custom** **Default: 7(1.00°/1.00°)**

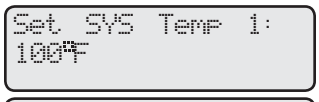
SET */<Out. Reset>/Reset Ratio*



- The Reset Ratio determines how the System Target temperature will vary with Outdoor temperature changes. The colder it gets outside, the hotter the Target will be. The Ratio is measured as; Outdoor (O): System Water (S).
- With a 1.00:4.00 ratio, the System water temperature will increase rapidly as the outside temperature falls hitting the maximum default water temperature of 240°F at 35°F outdoor temperature. With a 4.00 (O):1.00 (S) ratio, the System water temperature (S) will increase slowly as the outside temperature (O) falls.
- The Reset Ratio controls the amount of heat entering the heating system based on the outdoor temperature. A higher numbered Reset Ratio will result in a higher Calculated water temperature. See the Reset Ratio chart on page 2. If the application has radiant heat, a lower numbered Reset Ratio curve should be selected. See Type of Radiation in Building Table on page 2.
- Reset Ratios are adjustable based on the building and application. See suggested ratios on page 2.

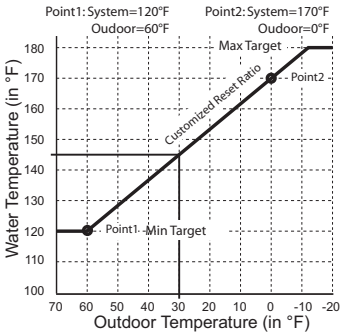
- If required: **Adjust the RESET RATIO in cold weather.** If the ambient building temperatures are too cold in cold weather, move the ratio to a higher selection. That is, if 1.00 (O):1.00 (S) was initially selected, change the selection to 1.00 (O):1.25 (S). If the building temperatures are too warm in cold weather, move the ratio to a lower selection. That is, if 1.00 (O):1.00 (S) was initially selected, change the selection to 1.25 (O):1.00 (S).
- The Custom option gives the user the capability of creating a specialized Reset Ratio curve. Setting two points on the Reset Ratio chart generates the customized curve. Each point requires a System Water Temperature SYS and an Outdoor Temperature OD. The line connecting the two points will be the reset ratio. The Offset, Minimum Target and Maximum Target settings will still apply to the customized curve.

Custom Outdoor Reset Curve



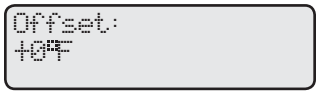
Options: **Sys Temp 1, 2 (-10ºF/21ºC) to (210ºF/99ºC) Default: 1(100ºF/38ºC), 2(171ºF/77ºC)**
Options: **Outdoor Temp 1, 2 (-10ºF/-23ºC) to (100ºF/38ºC) Default: 1(70ºF/21ºC), 2(0ºF/-18ºC)**
SET */<Out. Reset>/Reset Ratio/Custom*

- For situations where the standard reset ratios do not provide the perfect building heat-loss equilibrium, the customized option can be used.
- The Custom Reset Ratio is only available when Custom is selected from the Reset Ratio menu. It provides the user with the capability of assigning two points on the reset ratio diagram and use the line that connects those two points as the customized reset ratio curve. Each of the two points will need a specific System and Outdoor Temperature to identify it on the diagram.
- To Specify the first point, set Sys Temp 1, and OD Temp 1. Then, set Sys Temp 2, and OD Temp 2, to set the second point on the curve. The two points can be any where on the line, not necessarily at the ends.
- The chart shows an example of a customized curve 6(O):5(S) that does not exist in the standard curve options. If the outdoor temperature reaches 30ºF, the system target will be 145ºF.
- Remember that the Min Target and Max Target apply to all reset ratios including the custom reset ratio ones.



Custom Reset Ratio

Offset (Available when Startup Control Mode = Outdoor Reset)



Options: **From -40ºF/-22ºC to +40ºF/+22ºC Default: 0ºF/0ºC**
SET */<Out. Reset>/Offset*

- The Offset setting adjusts the starting points of the Reset Ratio curves. This means that, regardless of the Outdoor temperature or the Reset Ratio, when the Offset setting is changed, that change is directly added to or subtracted from the calculated Target. For example, if the Set Point temperature was 130°F and the Offset was changed from 0° to +10°, then the Set Point temperature would increase to 140°F
- If required: **Adjust the Water Offset in mild weather**. If the ambient building temperatures are too warm in the mild weather, decrease the Offset. If the ambient building temperatures are too cold in the mild weather, increase the Offset. The rule of thumb for baseboard radiation is to change the Offset 4°F for every 1°F you wish to change the building temperatures. In radiant heat applications, change the Offset 1°F or 2°F for every 1°F you wish to change the building temperature. See Type of Radiation in Building Table on page 2.

Outdoor Cutoff

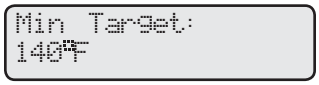
Options: **Off, 30ºF/0ºC to 75ºF/25ºC, On Default: 60ºF/16ºC**
SET */Set Point/Cutoff* **in Set Point**
SET */Set Point/<Out. Reset>/Cutoff* **in Reset**

- In Set Point Mode, if the outdoor sensor is installed, the Outdoor Cutoff setting screen will automatically appear after the temperature Set Point has been selected.
- The Outdoor and Cutoff temperatures can be viewed from the default screen by clicking the Up or Down buttons.
- When the outdoor temperature falls to the adjustable Outdoor Cutoff temperature, the BCP-3 will control the System Pump and Boiler relays to provide heat.
- When the outdoor temperature rises to the Outdoor Cutoff plus a 2°F differential, the BCP-3 will turn the boilers off. The System relay will remain energized for the Run-On delay then de-energize.
- The Outdoor Cutoff can be set from 30°F to 75°F. In addition, the Setting can be set to ON or OFF. If ON is selected, the System Relay will run regardless of the Outdoor temperature and the boilers will be active to hold the calculated water temperature. If OFF is selected, the System and Boiler relays will always be off.

Minimum Target (Available when Startup Control Mode = Outdoor Reset)

Options: **From 70ºF/21ºC to 170ºF/77ºC** **Default: 140ºF/60ºC**

SET */Set Point/<Out. Reset>/Min. Tgt*

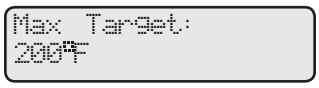


- The Minimum Target Temperature must be set to the boiler manufacturer's specification. The BCP-3 will calculate the Target based on the Outdoor temperature, the Reset Ratio, and the Offset value. The BCP-3 will control the boiler to hold the higher of either the calculated temperature or the Minimum Target Temperature.
- The Minimum Target Temperature must be at least 20°F lower than the Maximum Temperature (See next setting).

Maximum Target (Available when Startup Control Mode = Outdoor Reset)

Options: **From 90ºF/38ºC to 240ºF/116ºC** **Default: 200ºF/93ºC**

SET */Set Point/<Out. Reset>/Max. Tgt*

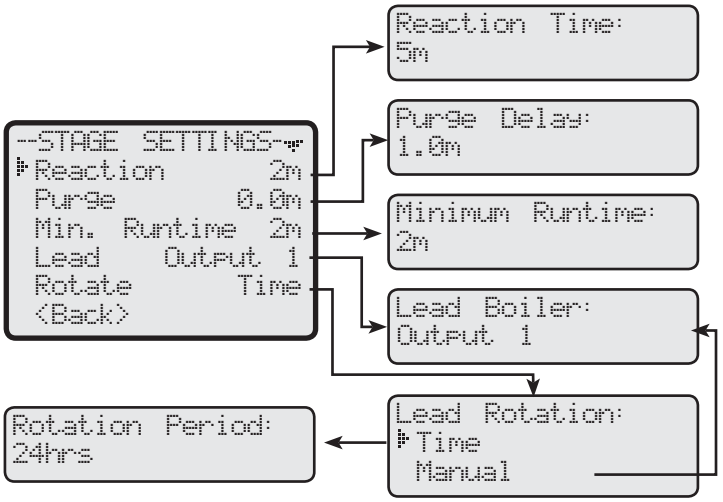


- This is the highest Target Temperature the BCP-3 will circulate through the heating system.
- When using a radiation system, it should be set according to the tubing or floor manufacturer's specification.
- The Maximum Temperature must be at least 20°F higher than the Minimum Temperature.

Stage Menu Options

SET */<Settings>/<Stage>*

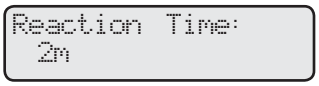
This menu is only available when multiple stages or multiple boilers are selected as the Output Mode from the Startup Menu.



Reaction Time

Options: **1 to 10 minutes** **Default: 2 minutes**

SET */<Settings>/<Stage>/Reaction*



- It is the amount of time it takes a single stage to affect the system.
- After the BCP-3 turns on a stage trying to meet a set point, it will not turn on another stage until the reaction time has elapsed. Then, it will recalculate if an additional stage is need.
- To determine the optimum time, in a heating system start with a hot system. Then, turn on a single stage and calculate how long it takes until the system begins to respond to that stage by rising an additional 2°F. That period should be set as the Reaction Time.

Purge

Options: **0.0 to 10 minutes** **Default: 1.0 minutes**

SET */<Settings>/<Stage>/Purge*

- Most large units must go through a purge cycle before they are brought on line.
- When the BCP-3 activates a unit (the lowest firing stage on a boiler), it does not start to calculate its output until the Purge Delay is over. This allows the boiler to fully come on and begin producing output.
- The Purge Delay helps prevent short cycling of newly activated boilers. Once the lowest boiler stage is activated, it MUST run through the entire Purge Delay period before starting the Reaction Time calculation..
- The Purge Delay setting MUST be set to the time required by the boiler's manufacturer specification.

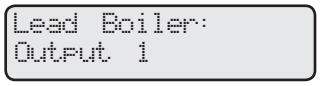
Minimum Runtime

Options: **1 to 60 minutes** **Default: 2 minutes**

SET */<Settings>/<Stage>/Min. Runtime*

- This is the minimum amount of time any stage will run.
- The Minimum Runtime for the lowest firing stage on a boiler starts after the purge cycle.
- Initially, set the Min. Runtime to half the Reaction Time.
- If System tends to overshoot, reduce the Min. Runtime. If boilers tend to short cycle, increase the Min. Runtime.

Lead Boiler (Not Available for Lo/Hi or 1-On/Off Output Modes)

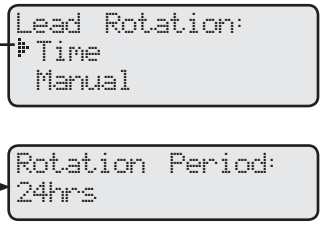


Options: **Output 1, Output 2, or Output 3** **Default: Output 1**

SET */<Settings>/<Stage>/Lead*

- The Lead boiler will always be the first boiler brought on when there is a call for output. As more heat is needed, additional boilers are added.

Lead Rotation (Not Available for Lo/Hi or 1-On/Off Output Modes)



Lead Rotation Options: **Manual or Time** **Default: Time**

Rotation Period Options: **1 to 999 Hours** **Default: 24 Hours**

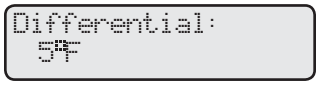
SET */<Settings>/<Stage>/Lead*

SET */<Settings>/<Stage>/Lead/Rotate*

- The Lead boiler can be rotated automatically based on time or manually. The Time rotation is recommended for most applications.
- If Time is selected, a second screen will allow the adjustment of the Auto Rotate Period If 24 Hours (default setting) was selected, the first rotation will take effect after 12 hours. The following rotations will take place every 24 hours thereafter.
- If Manual Lead Rotation is selected, it will be followed by the Lead Boiler selection option. (See previous topic.)

Single On/Off Boiler and System Pump Settings

Differential (Available for Single-Boiler Applications only)



Options: **From 1°F/1°C to 20°F/11°C** **Default: 5°F/3°C**

SET */<Settings>/Diff.*

- The Differential controls boiler cycling. When there is a call for heat, the boiler will be activated until the Calculated temperature is reached. The boiler will then turn off and stay off until the system water temperature falls to the Set Point less the Differential.
- A smaller Differential setting will normally result in tighter control of the set point but will tend to increase the frequency of boiler cycling. Larger Differential values will reduce boiler short cycling, but the system will be allowed to vary further from the target value.

Run-On (Not Available for 3-On/Off Output Mode)

Options: **From 0 min to 60 min** **Default: 2 min**

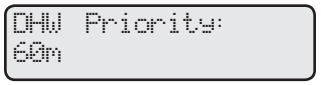
SET */<Settings>/Run On*

- The System Pump relay will energize whenever the Outdoor temperature is below the Outdoor Cutoff. When the Outdoor temperature increases 2°F above the Outdoor Cutoff and after the boiler relay has de-energized, the pump relay will stay on for a period set by the Run-On. This allows the Pump to dissipate the residual heat within the boilers back into the system.
- The Run-On time should be set based on the size and type of the boilers and pump. In general, a boiler with large water content and high horsepower will need a longer Run-On than a boiler with the same horsepower and less water content. (Refer to boiler manufacturer recommendation).
- When DHW Priority is selected while the EXT+/EXT- (Enable/Disable terminals) are open or the outdoor temperature is above the Outdoor Cutoff, a DHW call will energize only the DHW relay. When the DHW call expires, the DHW Pump relay will run for the Run-On period then de-energize.

Domestic Hot Water (DHW) Priority

Options: **NO and From 1 min to 120 min** **Default: NO**

SET */Settings>/DHW Prior.*

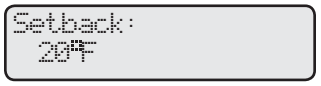


- The DHW Priority, with a value set to other than NO, provides the user with an adjustable DHW priority timer for the domestic hot water call. That is, initiating a DHW call will de-energize the system pump relay for the period set by the DHW Priority. However, the DHW relay, when 1-On/Off+2-Pump is selected as the Output mode from the Startup menu, will remain energized for as long as the DHW is active. This will take place whenever the Outdoor temperature is below Outdoor Cutoff and the EXT+/ EXT- (Enable/Disable terminals) are closed/shorted.
- On the other hand, when the EXT+/EXT- (Enable/Disable terminals) are open or the Outdoor temperature is 2°F above the Outdoor Cutoff, a DHW priority call will energize the DHW pump and boiler relays. When the DHW call expires, the DHW Pump relay will remain energized for the Run-On delay then de-energize.
- If NO was selected as the option for the DHW Priority, a DHW call will energize both relays, system pump and DHW pump even when TSTAT is de-activated.

Setback

Options: **From 0ºF/0ºC to 80ºF/44ºC** **Default: 10ºF/6ºC**

SET */Settings>/Setback.*



- The Setback feature can be used to provide the BCP-3 with a lower temperature Set Point when less heat is required by closing the P+ and P- terminals.
- The lower Set Point will appear on the main display indicating SBC TGT= .
- For example; when the calculated temperature is 160°F and the Setback is set to 20°F, a setback call will change the Set Point to (160°F - 20°F) 140°F.
- A typical use for the Setback is to provide a reduced system temperature to a building during the night or on the weekends when building is not occupied, but heat is still required.
- The Setback is activated by closing/shorting the P+ and P- terminals using an external timer, control, or a switch.

Boost

Options: **Yes, No** **Default: No**

SET */Settings>/Setback/Boost.*

- The morning Boost is designed to return the building to comfortable ambient temperatures after the night Setback period. The BCP-3 will accomplish this by running elevated water temperatures (will add Setback setting to calculated water temperature) for 30 minutes after the opening of the setback terminals P+ and P-. That is, if the normal set point at a specific outdoor was 145˚F and the Setback setting was 20˚F, the boost will raise the system calculated temperature to 165˚F for 30 minutes after the setback.

System and Outdoor Trim

Options: **From -20Fº/-11Cº to +20Fº/+11Cº** **Default: 0Fº/0Cº**

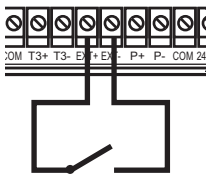
SET */<Maintenance>/Sys. Trm or Out. Trim*

- The Weil McLain sensors are very accurate. However, sometime it might be beneficial to adjust the values to match and existing system. The System and Outdoor Trim values adjust the System Sensor and Outdoor Sensor readings using positive or negative values.

Enable/Disable (TSTAT) Input

- The BCP-3 will provide heat only if the EXT- and EXT+ terminals are shorted. If no external equipment or switch is connected to these terminals, leave the factory jumper installed.
- When the terminals are OPEN, the Target will display TSTAT OPEN.
- Even if the EXT terminals are open, a call for DHW will energize the output relays based on the DHW Priority configuration.
- The Enable /Disable terminals can be used as a Summer/Winter switch when connected to an external switch.

Enable/Disable Wiring



NOTE: On a sensor fault while the Enable/Disable terminals are open, the control will follow the Enable /Disable state regardless of the sensor fault condition.

Troubleshooting

No Display or LED Lights

Check the power to the BCP-3. The BCP-3 requires 120VAC power to the Black wires or 24VAC to the right-most terminals. Turn the power off and back on to restore the display. If unsuccessful, make sure that the control's Display Cover is securely mounted to the Base.

System or Outdoor Reads OPEN or SHORT

If the sensor reads Open, short the sensor input terminals. The display should read SHORT. If it doesn't, the BCP-3 may be damaged.

If the sensor reads Short, remove the wires from the input terminals. The display should read OPEN. If it doesn't, the BCP-3 may be damaged.

System or Outdoor Sensor Reads an Incorrect Temperature

Remove the sensor wires from the input terminals. The display should change to read OPEN. If it doesn't, the BCP-3 may be damaged. Take an ohm reading across the detached sensor wires. The ohm reading should correspond to the Temperature Sensor Chart. If the difference is within 5°F adjust the sensor Trim. Otherwise, the sensor may be damaged.

No Heat - All LEDs are OFF

Check the outdoor temperature and the Outdoor Cutoff readings. If the outdoor temperature is above the Outdoor Cutoff, the BCP-3 will not give heat. If the display shows TSTAT OPEN then, check the EXT terminals. If the EXT terminals are not jumped together, the BCP-3 will not give heat.

No Heat - All LEDs are ON

First, make sure that the system pump is running. Remove any connections to the Yellow wires for the Heating System Pump. Test for continuity across the pair of Yellow wires. If the wires are continuous, the BCP-3 is calling for the Heating System Pump to run and the problem is not with the BCP-3. Check the power source to the pump and the pump to determine why it is not circulating.

Second, check the boiler operation and safety control status.

No Heat - System Pump LED ON

Check that the displayed System water temperature is below the Target water temperature minus the Differential. If not, wait until the System temperature falls, and then the stage LED should come on and the boiler should fire. Otherwise, remove all connections from the Blue pair of wires. Check for continuity across the pair of Blue wires using a meter. If the wires are continuous, the BCP-3 is calling for the boiler to run. Check the boiler to determine why it is not firing.

No Heat - Boiler LED ON

The BCP-3 is registering a call for DHW. If the DHW Priority is set to a value other than NO, the Heating System Pump will not run during the priority period of a DHW call. Generally, the DHW will be satisfied before a drop in ambient temperature is noticeable. If the DHW load is large or the boiler can satisfy both loads, change the Priority setting to NO, this will allow the Heating System Pump to circulate hot water to the building while the DHW tank is being satisfied.

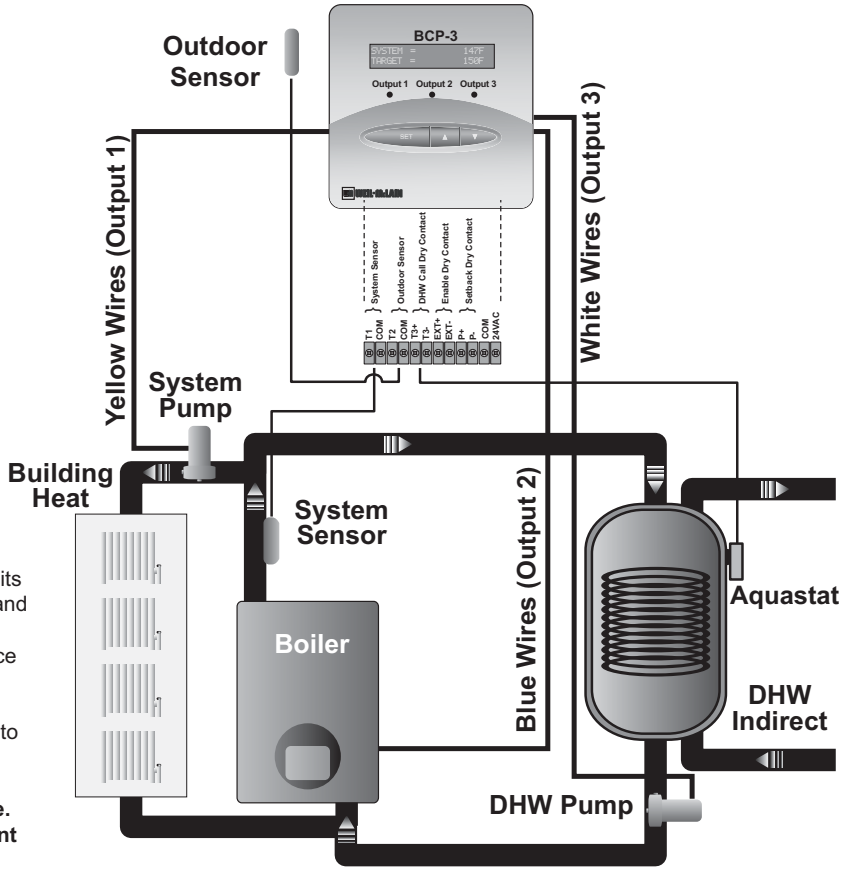
Temperature Sensor Chart

TEMPERATURE (in Degrees °F)	Value (in Ohms)
-30	117720
-20	82823
-10	59076
0	42683
10	31215
20	23089
25	19939
30	17264
35	14985
40	13040
45	11374
50	9944
55	8714
60	7653
70	5941
80	4649
90	3667

TEMPERATURE (in Degrees °F)	Value (in Ohms)
100	2914
110	2332
120	1879
130	1524
140	1243
150	1021
160	842
170	699
180	583
190	489
200	412
210	349
220	297
230	253
240	217
250	187

BCP-3 Plumbing Diagrams

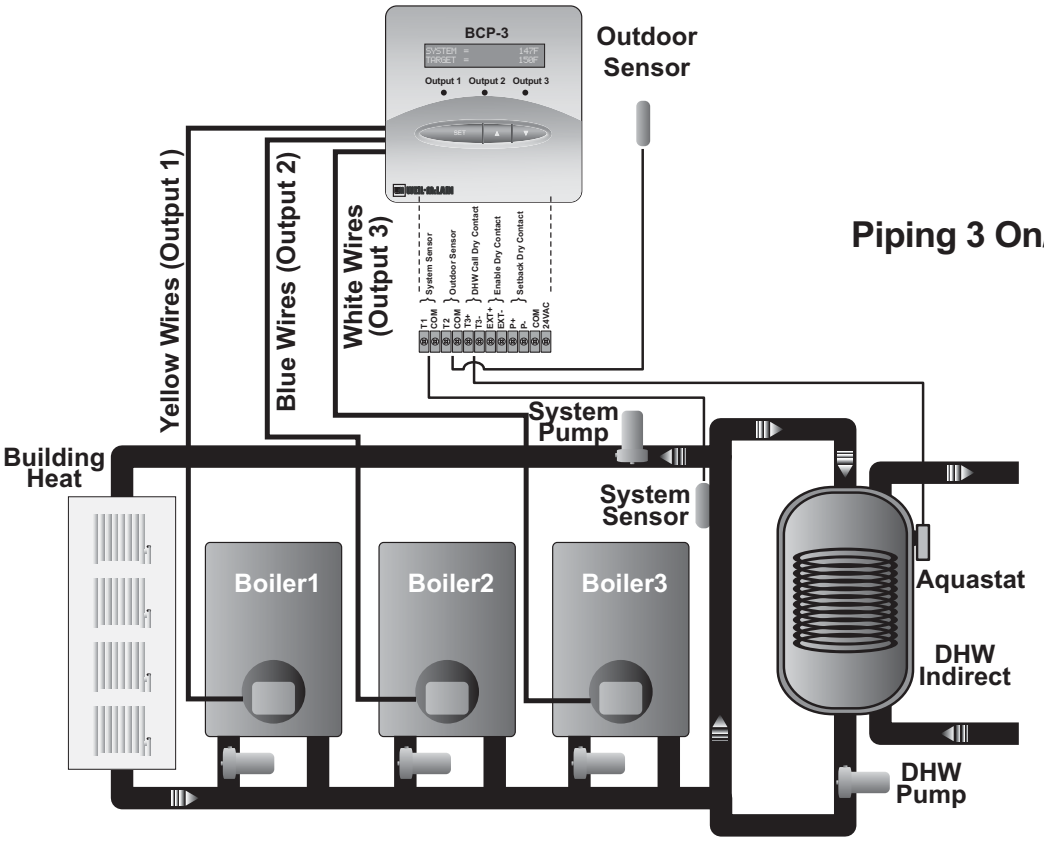
Piping 1 On/Off Boiler + System Pump + DHW Pump



NOTES:

- The BCP-3 does not source any output power to any of its relays. A power source must supply pumps with power and the control can break the hot leg.
- Weil McLain recommends using a separate power source to the control from any pumps, boilers, heavy electric equipment.
- When wiring a sensor to the BCP-3, connect the Shield to the COM terminal on the BCP-3 end. DO NOT connect the Shield at the sensor end.
- **Weil McLain is aware that each installation is unique. Thus, any wiring or piping diagrams in this document are to represent control operation concept only.**

Piping 3 On/Off Boilers



Specifications

Voltage Input: . . . . . 120 VAC 60 Hz(2 Black wires) /24VAC 60 Hz (24VAc terminals) (Only One Power Source)
Power Consumption: . . . . . .3 VA Max
Operating Temperature: . . . . . from 20°F to 120°F
Operating Humidity: . . . . . from 20% to 80%
Dimensions: . . . . . 4"W x 4"H x 2½"
Weight: . . . . . 1 pound
Display: . . . . . .Back Lite 2 Line Alphanumeric LCD Display
Display Units: . . . . . .Fahrenheit (ºF) and Celsius (ºC)
Outputs: . . . . . 3 S.P.S.T (Yellow = Output 1), (Blue = Output 2), (White = Output 3)
Output Relay Ratings: . . . . . 1 Amp inductive (Maximum of 1/8 HP), 6Amp resistive at 120 VAC 60 Hz
Control Modes: . . . . . Outdoor Reset, Set Point
Output Modes: . . . . . 1-On/Off+1-Pump, 1-On/Off+2-Pump, 1-Lo/Hi+1-Pump, 2-On/Off+1-Pump, 3-On/Off
Lead Rotation: . . . . . .Manual or Time (from 1Hr to 999Hr)
Purge Delay: . . . . . from 0.0 to 10.0 minutes
Reaction Time: . . . . . .from 1 to 10 minutes
Minimum Runtime: . . . . . from 1 to 60 minutes
Reset Ratios: . . . . . 12 Standard ranging from 8:1 to 1:4 (Outdoor: System), and one Custom
Offset: . . . . . from -40˚F (-22˚C) to 40˚F (+22˚C)
Minimum Target: . . . . . from 70˚F (21˚C) to 170˚F (77˚C)
Maximum Target: . . . . . .from 90˚F (38˚C) to 240˚F (116˚C)
Set Point: . . . . . .from -30˚F (-34˚C) to 250˚F (121˚C)
Pump Run-On: . . . . . .from 0 to 60 minutes
DHW Priority Timer Options: . . . . . No Priority, Priority from1 to 120 Minutes
Setback: . . . . . from 0˚F (0˚C) to 80˚F (44˚C)
Boost: . . . . . .Yes, No
Sensor Fault Operating Options: . . . . . Output On or Output Off
Sensor Operating Range: . . . . . from -35˚F (-37˚C) to 250˚F (121˚C)
LED: . . . . . .3 representing the Output relays
Buttons: . . . . . 3 (Set, Up, Down)
Enable/Disable: . . . . . Terminals EXT+, EXT-
DHW Input: . . . . . .Terminals T3+, T3-
Setback Input: . . . . . Terminals P+, P-

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